

REMARKS

Reconsideration of the application in light of the amendments and the following remarks is respectfully requested.

Status of the Claims

Claims 1-26 and 28-55 are pending, with claim 27 having been previously cancelled. Claims 1, 12, 16, 25, 26, 28, 36, 48, 50, and 52 have been amended. No new matter has been added. The Examiner has withdrawn claims 48-55 from consideration, contending that added claims 48-55 are distinct from the invention recited in claims 1-26 and 28-47. Applicant respectfully requests reconsideration of this restriction requirement. The teachings of the present invention are used to detect different portions of an ECG signal—this portion may be a QRS complex, or it could be a P-wave or T-wave. They share a common general approach. Accordingly, applicant has amended independent claims 48, 50 and 52 similar to the non-withdrawn claims, and requests that the Examiner consider these withdrawn, but amended claims, as well as the claims dependent therefrom, in light of the arguments and remarks presented herein for claims 1-26 and 28-55.

Rejections Under 35 U.S.C. § 112

Claims 25 and 26 have been rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. The Examiner is of the opinion that it is unclear whether these claims are independent or dependent claims. In response, applicant has amended these claims to be in independent format.

Rejections Under 35 U.S.C. § 102 and § 103

The Examiner has rejected claims 1-26 and 28-47 as being anticipated under 35 U.S.C. § 102(b) and/or obvious under 35 U.S.C. § 103(a) in view of U.S. Patent No. 4,884,345 to Long, U.S. Patent Publication 20030100923 to Bjorling et al. ("Bjorling"), and U.S. Patent No. 5,038,785 to Blakeley et al. ("Blakeley").

Specifically, the Examiner has rejected claims 1-9, 16-22, 28, and 30-33 as being anticipated under 35 U.S.C. § 102(b) by Long. The Examiner has also rejected claims 12-15, 33, and 36-39 as being unpatentable under 35 U.S.C. § 103(a) over Long in view of the Examiner's statement of obviousness. The Examiner contends that Long discloses an adjustable template for ECG analysis. The Examiner acknowledges that Long fails to disclose or suggest assigning a weighted score, but contends that it would have been obvious to one of ordinary skill in the art at the time of the invention to modify "the correlation to the ECG template . . . with a value or weighted score, in order to accurately correlate the features of the signal to the template."

Applicant respectfully disagrees with the substance of this rejection. The present claims, however, have been amended to more clearly distinguish over the cited references.

Claim 1, as amended, recites "correlating a QRS complex template with a continuous-in-time ECG signal of a patient to produce a correlation output" and "determining a threshold that when exceeded by the correlation output indicates that the continuous-in-time ECG signal substantially correlates with the QRS complex template." Independent claims 16, 25, 26 and 28, as amended, recite similar features. Additionally, independent claims 12 and 36, as amended, recite

similar features in the context of performing a correlation for each of a set of ECG channels. As discussed in the Specification, rather than triggering a MRI upon the time of a voltage exceeding a threshold, instead a correlation function triggers the MRI upon the time of a correlation exceeding a threshold. *See*, Specification, page 11, line 17 – page 12, line 14.

Independent claims 12 and 36, as amended, also recite additional features of “assigning a weighted score for each ECG channel indicative of a strength of the respective correlation output” and “determining a threshold that when exceeded by the correlation outputs. . . the threshold being a combined value of each continuous-in-time ECG signal in said set of ECG channels, and the contribution of each ECG channel to the threshold [is] proportionate to the assigned weighted score for each ECG channel.” Claims 12 and 36, as amended, also recite the features of “combining the correlation outputs for each ECG channel, the contribution of each ECG channel to the combined correlation being proportionate to the weighted score assigned to each ECG channel.”

Long fails to disclose or suggest the above-recited features of claims 1, 12, 16, 25, 26, 28, and 36, as amended. In contrast, Long discloses an adjustable template device 10 which can be adjusted, by hand, so that an ECG tracing placed beneath the template 10 can be seen and analyzed. *See*, Long, col. 6, line 26 through col. 7, line 13 and Figure 4. The template 10 contains a series of movable transparent plastic sheets (*e.g.*, AVI, AEI, PVARP, MTI) that slide within the template 10 so as to allow for pacing interval or number of pulses per minute measurements. *See*, Long, col. 8, lines 3-40 and Figures 1A-1D and 2A-2D.

The Examiner has also rejected claims 1-9, 16-22, 25-26, 28, and 30-33 as being anticipated under 35 U.S.C. § 102(e) by Bjorling. The Examiner has also rejected claims 12-15, 33, and 36-39 as being unpatentable under 35 U.S.C. § 103(a) over Bjorling and the Examiner's statement of obviousness. The Examiner contends that Bjorling discloses a QRS detector, template collector, and pattern recognition unit for analyzing ECG signals. *See*, Bjorling, paragraphs 0010 and 0037, and Figure 5. The Examiner acknowledges that Bjorling fails to disclose or suggest assigning a weighted score, but contends that it would have been obvious to one of ordinary skill in

the art at the time of the invention to modify “the correlation to the ECG template . . . with a value or weighted score, in order to accurately correlate the features of the signal to the template.”

Applicant respectfully disagrees with the Examiner. Bjorling fails to disclose or suggest the features of claims 1, 12, 16, 25, 26, 28, and 36, as amended. Bjorling discloses that “conventional detection algorithms analyze the signal by undertaking one or more threshold comparisons and/or by analyzing the rate of occurrence of a particular characteristic of the signal (*i.e.*, maxima, minima, zero crossings, etc.).” (Bjorling, paragraph 0010.) However, this does not equate to the correlation threshold recited in claims 1, 12, 16, 25, 26, 28, and 36, as amended, as discussed above. In particular, there is no indication in Bjorling that these “threshold comparisons” are anything other than a simple indication of a voltage exceeding a particular voltage threshold, nor does Bjorling disclose or suggest performing a correlation comparison of the signal to a template, as recited in claims 1, 12, 16, 25, 26, 28, and 36, as amended.

Further, although Bjorling discloses that the “[c]omparison of the signal waveform to stored signal templates, respectively representing previously-obtained abnormal signals, is also a known technique (Bjorling, paragraph 0010),” these stored signal templates represent *abnormal* signals which have been previously obtained. *See also*, Bjorling, paragraph 0016. There is no suggestion in Bjorling that the stored templates are of a “QRS complex template representative of a shape in time unique to QRS complex” as recited in claims 1, 12, 16, 25, 26, 28, and 36, as amended.

Additionally, in Bjorling, there is no QRS complex template that is “correlat[ed] . . . with a continuous-in-time ECG signal,” as recited in claims 1, 16, 25, 26, and 28, as amended, or “with each continuous-in-time ECG signal” as recited in claims 12 and 36, as amended. In contrast, Bjorling discloses that a correlation calculation is performed between two unipolar signals, which are obtained from two different electrode dots 1-7, for different time shifts. *See*, Bjorling, paragraphs 0034-0037. Further, although Bjorling discloses multiple electrode dots 1-7 that each provide a respective unipolar signal, Bjorling fails to disclose or suggest multiple ECG channels, or a weighted threshold based on the multiple ECG channels, as recited in independent claims 12 and 36, as amended.

Thus, as described above, Bjorling fails to disclose each and every feature recited in independent claims 1, 12, 16, 25, 26, 28, and 36, as amended. Dependent claims 2-11, 13-15, 17-26, 29-35, and 37-47 are patentable for at least the same reasons as discussed above with respect to their respective base claim.

The Examiner has rejected claims 1-5, 7-11, 16-26, 38-32, 34-35, 40-41, and 44-45 as being anticipated under 35 U.S.C. § 102(b) by and/or unpatentable under 35 U.S.C. § 103(a) over Blakeley. Claims 6, 12-15, 33, 36-39, and 42-43 have been rejected as being unpatentable under 35 U.S.C. § 103(a) over Blakeley and the Examiner’s statement of obviousness. The Examiner contends that Blakeley discloses a voltage threshold detector 78 and comparing means 48 which are used in monitoring cardiac signals during a MRI scan. The Examiner acknowledges that Blakeley fails to disclose or suggest assigning a weighted score, but contends that it would have been obvious to one of ordinary skill in the art at the time of the invention to modify “the correlation to the ECG

template . . . with a value or weighted score, in order to accurately correlate the features of the signal to the template.”

Applicant respectfully disagrees with the Examiner. Blakeley fails to disclose or suggest the features of claims 1, 12, 16, 25, 26, 28, and 36, as amended. In particular, Blakeley discloses using a voltage threshold detector 78, which “establishes a threshold level at two thirds of the previous R-wave peak derivative” so as to detect the R-wave peaks of the cardiac cycle. *See*, Blakeley, col. 6, lines 51-56. However, this does not equate to the threshold recited in claims 1, 12, 16, 25, 26, 28, and 36, as amended. In particular, there is no indication in Blakeley that the “threshold level” is anything other than a simple indication of a voltage exceeding a particular voltage threshold, and therefore is not a threshold of correlation as recited in claims 1, 12, 16, 25, 26, 28, and 36, as amended.

Furthermore, contrary to the Examiner’s position, Blakeley’s comparing means 48 does not correlate the signal to a template. *See*, Detailed Action, page 5, paragraph 1. Rather, Blakeley merely discloses that the “comparing means 48 compares the slope or other preselected property of the received signal with preselected standards . . . [such as] amplitude, characteristic wave shape, proximity of characteristic wave shapes, relative height of characteristic wave shapes, relative duration of characteristic wave shapes, relationships among proximate wave forms, and the like . . . [to differentiate] between the anatomical condition signal and the superimposed noise.” (Blakeley, col. 4, lines 66-68; col. 5, lines 7-14.) However, a “preselected property” or “preselected standard” does not equate to, nor is equivalent to, a “QRS complex template representative of a shape in time unique to QRS complex” as recited in claims 1, 12, 16, 25, 26, 28, and 36, as amended. Nor does

Blakeley disclose or suggest performing a correlation comparison of the signal to a template, as recited in claims 1, 12, 16, 25, 26, 28, and 36, as amended.

In addition, Blakeley fails to disclose or suggest multiple ECG channels, or a weighted threshold based on multiple ECG channels, as recited in independent claims 12 and 36, as amended. Blakeley merely discloses a signal combining/summing means 66 which “adds or otherwise combines the cardiac and respiratory signals.” (Blakeley, col. 6, lines 23-24.) However, there is no teaching or suggestion in Blakeley for “assigning a weighted score for each ECG channel indicative of a strength of the correlation” and “determining a threshold that when exceeded by the correlation outputs. . . the threshold being a combined value of each continuous-in-time ECG signal in said set of ECG channels, and the contribution of each ECG channel to the threshold [is] proportionate to the assigned weighted score for each ECG channel,” as recited in claims 12 and 36, as amended.

Thus, as discussed above, Blakeley fails to disclose each and every feature recited in independent claims 1, 12, 16, 25, 26, 28, and 36. Dependent claims 2-11, 13-15, 17-26, 29-35, and 37-47 are patentable for at least the same reasons as discussed above with respect to their respective base claim.

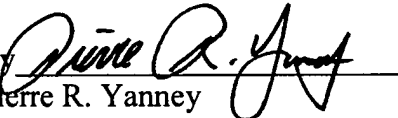
CONCLUSION

Each and every point raised in the Final Office Action dated June 4, 2007 has been addressed on the basis of the above amendments and remarks. In view of the foregoing it is believed that claims 1-26 and 28-47 are in condition for allowance and it is respectfully requested that the application be reconsidered and that all pending claims be allowed and the case passed to issue.

If there are any other issues remaining which the Examiner believes could be resolved through a Supplemental Response or an Examiner's Amendment, the Examiner is respectfully requested to contact the undersigned at the telephone number indicated below.

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Respectfully submitted,

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